

## Kentucky Geological Survey

228 Mining & Mineral  
Resources Bldg.  
University of Kentucky  
Lexington, KY  
40506-0107  
859.257.5500  
fax 859.257.1147  
www.uky.edu/KGS

James Cobb, State  
Geologist and  
Director  
John Kiefer, Assistant  
State Geologist  
Carol Ruthven, Editor,  
*Kentucky Geology*

Our mission is to  
increase knowledge and  
understanding of the  
mineral, energy, and  
water resources,  
geologic hazards, and  
geology of Kentucky for  
the benefit of the  
Commonwealth and  
Nation.

### In this issue

A Milestone for Kentucky	1
GIS Instructors at Federal Prison	1
Director's Desk	2
Second Annual KGS Internship Program	2
In Focus— Blazing a Trail with Digital Geologic Maps	insert
Field Notes	3
Did You Know?	3
Spotlight on New Publications	3
Calendar of Events	4

## New geologic map products— *A milestone for Kentucky*

**E**rnie Fletcher, congressman for the Sixth District of Kentucky, visited the Kentucky Geological Survey (KGS) on September 4. Geologists at KGS explained current research in karst groundwater studies, oil and natural gas exploration, and the digital conversion of geologic quadrangle maps. State Geologist **Jim Cobb** presented Congressman Fletcher with the newly printed 1:100,000-scale “Geologic Map of the Harrodsburg 30 x 60 Minute Quadrangle, Central Kentucky,” by **Thomas Sparks, Garland Dever, and Warren Anderson**. This map of a

1,885-square-mile area encompasses all or parts of 15 counties, the towns of **Harrodsburg, Nicholasville, Danville, Berea, Richmond, and Winchester**, and includes part of the Sixth District of Kentucky, represented by Congressman Fletcher.

The Harrodsburg map is published as a traditional geologic map, but its creation



*State Geologist Jim Cobb presents a framed copy of the Harrodsburg map to Congressman Fletcher.*

and potential applications are not traditional. This map is a milestone for KGS, Kentucky, and the STATEMAP Program of the U.S. Geological Survey. Its scale of 1:100,000 marks the first

*(Continued on page 3)*

## KGS geologists volunteer— *GIS instructors at Federal prison*

**S**taff from KGS are participating in a geographic information system (GIS) training program at the Federal Bureau of Prisons—Atwood Camp in **Lexington**. Inmates who are within 18 months of their release are provided training to prepare them for a career as a GIS technician. Participants receive certificates of achievement in digital cartography from KGS for their contribution to the digital atlas of groundwater in Kentucky. In addition to GIS concepts and real-life exercises, students earn certificates for completion of three ESRI (Environmental Systems Research Institute Inc.) courses. **Steve Cordiviola** and

**Dan Carey** are volunteer instructors in the cooperative program between the U.S. Bureau of Prisons and the University of Kentucky, with a software grant from ESRI. The first class of students graduated on September 15, 2000, and the second class on July 1, 2001. The response to the program has been enthusiastic. If you are interested in helping these students with instruction in this program, or are interested in hiring these

graduates, please contact **Dan Carey**, Kentucky Geological Survey (859.257.5500 ext. 157, [carey@kgs.mm.uky.edu](mailto:carey@kgs.mm.uky.edu)) or **Steve Kinzy**, ESRI—St. Louis (636.949.6620 ext. 8514, [skinzy@esri.com](mailto:skinzy@esri.com)). ♦



*2001 graduates of the GIS training program. Dan Carey is at left in back row.*

## Director's Desk



Did you know that in the not-too-distant future, digital geologic map data for the entire state will be available to anyone with a PC and the proper software to manipulate the data? For the past several years, KGS has been converting into digital format the 1:24,000-scale paper maps from the U.S. Geological Survey–Kentucky Geological Survey program. We recently took a big step forward by releasing to the public the first data from our digital mapping program. The data are grouped by 7.5-minute quadrangle, and this first release is for the thirty-two 7.5-minute quadrangles that make up the Harrodsburg 30 x 60 minute quadrangle in central Kentucky.

KGS is using a vector digitizing process to capture geologic features, such as faults, contacts, outcrops, and formations, from the paper maps. The data sets for the 7.5-minute quadrangles contain separate computer files (or layers) for geologic features. If all the layers for a particular quadrangle are displayed together, the result is similar to the original published geologic

quadrangle map. The user can also pick and choose which layers to display, or use data from several different quadrangles.

Only recently have PC's become capable of handling geologic mapping. Previously, powerful computers with sophisticated software (and by extension, sophisticated users) were required. Now off-the-shelf PC's and software can do the job. Our digital data can be loaded into a program such as ArcView or AutoCAD Map, then can be displayed on a screen, pasted into a report, plotted on paper, and manipulated or combined with other data as the user desires.

Over the next 2 to 3 years, data for all 707 of Kentucky's 7.5-minute quadrangles will be released. This is a new and exciting product for KGS. We are eager to receive feedback so we can continue to improve the product. We think this information will be much in demand: a recent survey of professional geologists indicated that 80 percent of them place a high value on digitized geologic maps. We hope this will be the



beginning of a successful use of new technology to serve the public, and we at KGS are proud to be among the first to offer this type of digital data to the public. ♦

*James C. Cobb*

### A tremendous success

#### Second annual KGS internship program

Following the tremendous success of the internship program for geology students last summer, KGS offered the program again this summer, with additional funding from the National Science Foundation and the Association of American State Geologists. The interns collected GPS (Global Positioning System) data (latitude, longitude, and elevation points) to verify in the field the accuracy of data on new digital geologic quadrangle maps. They also participated in a dye-trace project to determine the paths of subsurface groundwater flow in the Inner Bluegrass for pollution control and water-quality protection.

Students working at the Survey also participated in the activities organized for the interns. Two of the interns from the summer of 2000, **Bethany Overfield** and **Matt Crawford**, are now working at KGS.

This is what the interns had to say about their experience:

**Laura DeMott**, Western Kentucky University: "This summer experience has taught me so much it is hard to put it into words. The most valuable thing about it is that it has given me real-world experience in the geologic field. I really enjoyed the field work, being outside doing dye tracing. I learned a lot about the technique and the steps you have to go through in order to do a trace. This experience will help me a great deal in the future, because it gave me a chance to put the theories learned in the classroom to practical use in the field."

**Derek Stakelin**, Morehead State University: "The experience that I gain at the KGS will be the biggest work experience in my life. The reason why, is it is so hard to find work experience as an undergraduate student around Kentucky in the field of geology. The

KGS is great about getting work experience while you are an undergraduate student working towards your degree. This job is a big 'stepping stone' towards my career in the future."

**Rob Hoppenjans**, Northern Kentucky University: "I have learned how to use a  
(Continued on page 4)



(L-r): Derek Stakelin, Rob Hoppenjans, Andrea Hougham, William Knizner, Laura DeMott, and Sarah Hawkins, along with Associate Professor Sue Rimmer of the UK Department of Geological Sciences, and State Geologist Jim Cobb.

Carol L. Ruthven

### New 1:100,000-scale map series

Kentucky is the only state of significant size to be completely mapped geologically at a scale of 1:24,000 (1 inch on the map corresponds to 2,000 feet on the ground). The availability of geologic maps in Kentucky has been a great benefit for economic development, environmental protection, and hazard mitigation. Geologic map data are essential in order to address problems such as landslides, flooding, groundwater supply and protection, and locating waste-disposal and septic systems. There is now a great need for these maps to be made available in digital form for use in computer programs.

The Kentucky Geological Survey (KGS) is responding to this need. During the past 5 years, KGS has undertaken an ambitious project to convert all 707 geologic quadrangle maps (7.5-minute, 1:24,000 scale) into digital data sets that can be used in geographic information systems (GIS) and other software to address problems experienced in everyday life. As of November 2001, more than 500 of the

707 maps have been digitized. Thirty-two of the digital data sets are publicly available, and many more will be available in the near future.

After the 1:24,000-scale geologic quadrangle maps are digitized, they are digitally compiled to create new 1:100,000-scale geologic maps that will offer an unprecedented regional perspective and fidelity of detail. (A scale of 1:100,000 means that 1 inch on the map represents 100,000 inches, or 1.6 miles, on the ground.) The 1:100,000-scale maps present an intermediate scale, compared to previously published geologic maps, which preserves detail and provides a regional view of trends in geology. These maps will enable geologists to understand structural trends such as the extent of a fault system and its effect on the distribution of rock units, the location of mineral and other resources, and changes in the thickness of rock units across a large region.

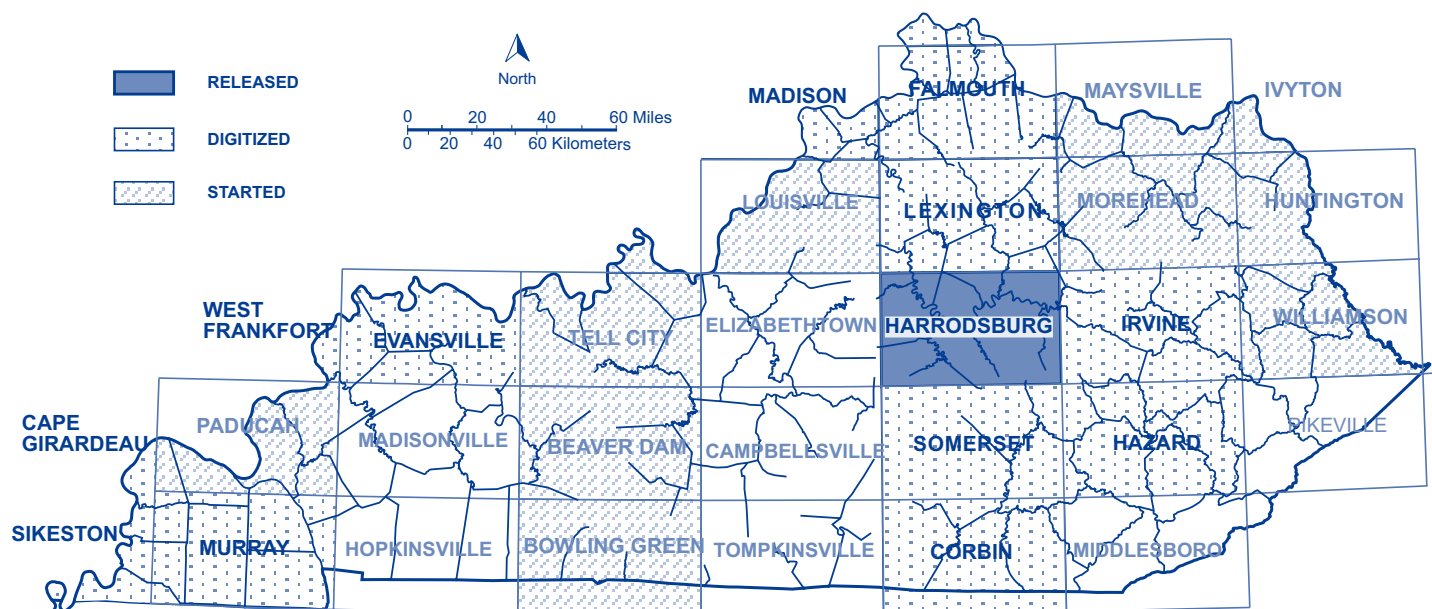
As each new 1:100,000-scale map is published, there is tremendous potential for exciting discoveries about the geology of Kentucky to be revealed. The maps will also be ideal for regional and county-level planning. Priority is

being placed on preparing the 1:100,000-scale maps for the major population centers in the state.

### Harrodsburg map of central Kentucky

The first map to be published in the new 1:100,000-scale series is the "Geologic Map of the Harrodsburg 30 x 60 Minute Quadrangle, Central Kentucky," by **Thomas Sparks, Garland Dever, and Warren Anderson**. This map of a 1,885-square-mile area encompasses all or parts of 15 counties, which together have more than half a million people.

The Harrodsburg map has the appearance of a traditional geologic map, but its creation and other aspects are not traditional. Because the Harrodsburg map was digitally compiled from 32 separate 1:24,000-scale 7.5-minute maps, the newly created 1:100,000-scale, 30 x 60 minute map has a similarly high level of accuracy and detail. With regional perspective and fidelity of detail, the Harrodsburg map and other maps published in the future in this series will provide the best of both worlds. Copies of the



Status of Kentucky Geological Survey digital mapping program, November 2001. Check the KGS Web site at [www.uky.edu/KGS/statusmap](http://www.uky.edu/KGS/statusmap) for current status information.

Harrodsburg map may be purchased at KGS Publication Sales for \$15 each. The next map to be published will be for the Lexington 30 x 60 minute quadrangle.

### *Geologic map data sets*

The digital data sets used to create the Harrodsburg map are now available, individually or in groups, on CD-ROM for \$10 per quadrangle. Each 7.5-minute quadrangle data set includes vectorized geologic map information in ESRI (Environmental Systems Research Institute Inc.) shapefile format and FGDC-compliant metadata. The data derived from the original geologic quadrangle maps include formation rock units, geologic contacts, structure contours, faults, fossil locations, and economic features. The shapefiles are prepared in latitude/longitude coordinates; both NAD27 and NAD83 datum versions are supplied for ease in creating projected views of the maps. All data sets have been edge matched to permit seamless alignment of adjoining map areas. A tutorial is provided that explains the format of the data and other necessary information for its use. Lithologic descriptions of map units are included in an easily searchable “help” file.

**KGS’s innovative geologic map products will aid development, design, and planning decisions in Kentucky.**

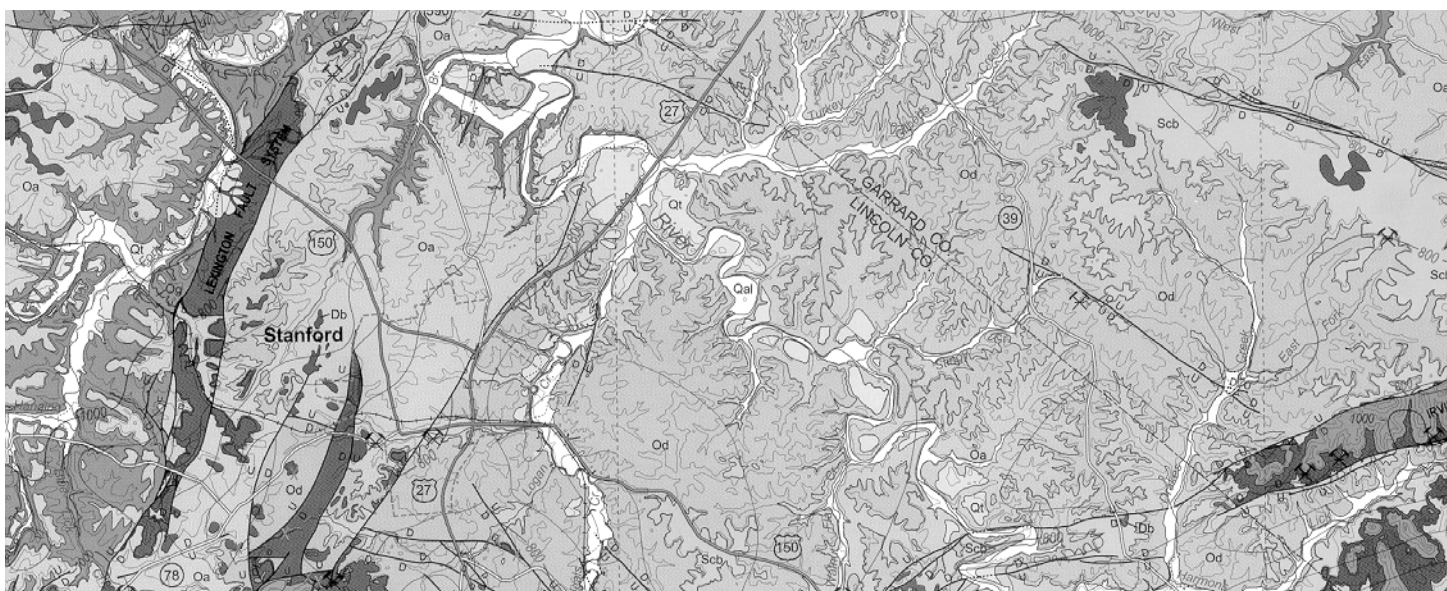
The digital geologic data sets allow persons to use geologic information from the GQ’s together with other kinds of data—agricultural, archeological, biological, engineering, geographical, and medical—in GIS and other software. The GIS format allows persons to visualize and measure relationships among different data to prepare custom-designed maps to meet company or project requirements. The digitally vectorized geologic quadrangles (DVGQ’s) are ideal for regional and county-level planning:

- ◆ land-use planning and development
- ◆ planning and constructing roads and highways
- ◆ managing watersheds
- ◆ restoring wetlands
- ◆ mitigating geologic hazards (for example, landslides, flooding, sinkhole collapse, subsidence)
- ◆ developing oil, natural gas, coal, and mineral resources

A sample data set from the KGS digital mapping database is available to download at no charge from the KGS Web site at [www.uky.edu/kgs/sampledvgq](http://www.uky.edu/kgs/sampledvgq). For information about the digital mapping program, visit the KGS Web site at [www.uky.edu/kgs/digitalmapping](http://www.uky.edu/kgs/digitalmapping). To order the digital data sets on CD-ROM, contact **Bart Davidson** at 859.257.5500 ext. 122 ([bdavidson@kgs.mm.uky.edu](mailto:bdavidson@kgs.mm.uky.edu)) or **Richard Smath** at 859.257.5500 ext. 119 ([rsmath@kgs.mm.uky.edu](mailto:rsmath@kgs.mm.uky.edu)).

### *Acknowledgments*

The Kentucky Geological Survey is grateful to the U.S. Geological Survey for its support of the Kentucky digital geology program, under the STATEMAP section of the National Cooperative Geologic Mapping Act of 1992. KGS is also grateful to the Association of American State Geologists and the U.S. Geological Survey, who worked to get this act passed in 1992 and for its reauthorization in 1997 and 1999. ♦



Kentucky Geological Survey, 228 Mining and Mineral Resources Building,  
Lexington, KY 40506-0107

Phone: 859.257.5500

Fax: 859.257.1147

[www.uky.edu/kgs](http://www.uky.edu/kgs)

Visit the KGS online catalog of publications at [www.uky.edu/kgs/pubs/lop.htm](http://www.uky.edu/kgs/pubs/lop.htm)

*Digital geologic map data sets were used to prepare the Harrodsburg 30 x 60 minute map. This is a portion of the map, shown here in black and white (the published map is in color).*

## Field notes from across Kentucky

### KGS caver honored

**Randy Paylor** received a Fellow Award from the National Speleological Society (NSS) at its annual convention, held this year in **Mt. Vernon, Ky.**, on July 27. This prestigious award is given in recognition of consistent effort in promoting the goals of the NSS and exemplary achievements in speleology. Approximately 20 members receive these certificates each year out of a membership in the society of over 12,000. ❖

### Ecoregions map of Kentucky

**William (Drew) Andrews** has been working with other State agencies and associated Federal offices to help develop an ecoregions map of Kentucky. Personnel from the U.S. Environmental Protection Agency have coordinated the effort. When completed, this map will provide a common framework for State agencies to manage the diverse ecosystems found in various parts of the state. From August 27 through 30, participants on an ecoregions field verification trip examined the natural landscape across

many parts of the state, and Drew provided the geologic and physiographic background for the trip. Other trip leaders discussed vegetation, stream biology and quality, and soils. ❖

### Geologic hazards and highway engineering

**Assistant State Geologist John Kiefer** is a member of the Appalachian States Coalition for Geological Hazards and Transportation. This coalition, created in the spring of 2001, has representatives from state geological surveys and transportation departments in Kentucky, West Virginia, Ohio, and Pennsylvania, the U.S. Army Corps of Engineers, the Federal Highway Administration, the U.S. Geological Survey, and railroads in the Appalachian states. The members are cooperating in research and technology-transfer initiatives related to geotechnical issues that affect highway engineering (for example, rock falls, landslides, karst hazards, and mine subsidence). For more information, contact **John Kiefer** at 859.257.5500 ([kiefer@kgs.mm.uky.edu](mailto:kiefer@kgs.mm.uky.edu)). ❖

(*Milestone*, continued from page 1)

time geologic maps for Kentucky have been published at that scale. This will provide fresh insight into regional trends in geology in Kentucky. The digital data sets used to create the map are available to the public on CD-ROM. The digital data sets make it possible to use geologic information from the map together with other kinds of data—agricultural, archeological, biological, engineering, geographical, and medical—in geographic information systems (GIS) in order to design custom maps to meet company or project-specific needs.

For more information, consult the enclosed *In Focus* feature. ❖

### Did you know?

**H**orizontal and vertical geodetic control points (bench marks) in Kentucky have been established by a number of agencies in the past. Only the National Geodetic Survey (NGS; [www.ngs.noaa.gov](http://www.ngs.noaa.gov)) still maintains and updates the information on its control data for the United States for the current horizontal and vertical datums in a number of online searchable parameters. KGS can help you with information on horizontal and vertical geodetic control points that do not appear in the NGS online data. For more information, contact **Richard Smath** at 859.257.5500 ext. 119 ([rsmath@kgs.mm.uky.edu](mailto:rsmath@kgs.mm.uky.edu)). ❖



### Spotlight on new publications

#### *“Protect Kentucky’s Karst Aquifers from Nonpoint-Source Pollution,” by James Currens*

Although karst aquifers are vulnerable to pollution, in Kentucky they are an important source of water for agriculture and drinking water. This new color poster defines karst aquifers and nonpoint-source pollution, explains how karst aquifers become polluted, and outlines suggestions for protecting karst aquifers. This information will be of interest to environmentalists, naturalists, teachers and students, and the general public. For more information, contact **Jim Currens** at 859.257.5500 ([currens@kgs.mm.uky.edu](mailto:currens@kgs.mm.uky.edu)). The poster is available free of charge, although there is a postage charge for shipping. ❖

#### *“Mineral and Fuel Resources Map of Kentucky,” by Warren Anderson and Garland Dever*

This new color map, published at a 1:1,000,000 scale, shows areas producing coal, oil, natural gas, ore minerals, limestone, dolomite, sand and gravel, clay, and shale in Kentucky. Quarries, principal transportation routes, cities and towns, county boundaries, and major rivers are also shown. A discussion of resources, including graphs showing production histories for the principal commodities, is provided. A list of selected references is also included to guide users to detailed information about the geology, minerals, and fossil fuels of Kentucky. For more information, contact **Warren Anderson** or **Garland Dever** at 859.257.5500 ([wanderson@kgs.mm.uky.edu](mailto:wanderson@kgs.mm.uky.edu) or [gdever@kgs.mm.uky.edu](mailto:gdever@kgs.mm.uky.edu)). ❖

#### *“Hydrologic Conditions Around Deep Aeration Lagoons at the Bardstown Wastewater Treatment Plant,” by David Wunsch*

Deep aerated lagoons have been recognized as an efficient primary treatment process for sewage and wastewater. There has been concern, however, about their impact on the quality and movement of groundwater. The results of this study indicate that a lagoon used for a plant in Bardstown, a small city of approximately 6,200 residents in Nelson County, did not significantly contaminate the groundwater; in fact, the design and engineering used for this lagoon may be a model for cost-effective, efficient primary water-treatment systems. For more information, contact **Jim Dinger** at 859.257.5500 ext. 163 ([dinger@kgs.mm.uky.edu](mailto:dinger@kgs.mm.uky.edu)). ❖

## KGS mailing list

Would you like to receive the KGS newsletter and announcements of meetings and new publications? If so, we would like to add your name to our electronic mailing list. Please call us at 859.257.5500 or send an e-mail message to **Gwen**

**Phillips** at [gphillips@kgs.mm.uky.edu](mailto:gphillips@kgs.mm.uky.edu)—simply type “Electronic-Mailing List Addition” in the subject line of your message, type your mailing address and phone and fax number in the message—and we will include your name and address in our mailing list. ❖

## Calendar of events

- ♦ **March 10–13, 2002:** American Association of Petroleum Geologists (AAPG) Annual Convention and Exhibition, Houston, Tex., [convene@aapg.org](mailto:convene@aapg.org) (e-mail), [www.aapg.org](http://www.aapg.org) (Web site)
- ♦ **April 3–5, 2002:** Geological Society of America Southeastern–North-Central Section Meeting, Lexington, Ky., [www.uky.edu/kgs/gsa2002/](http://www.uky.edu/kgs/gsa2002/)
- ♦ **October 24–26, 2002:** Kentucky Science Teachers Association/National Science Teachers Association annual convention, Louisville, Ky.
- ♦ **October 27–30, 2002:** Geological Society of America annual meeting, Denver, Colo., [www.geosociety.org](http://www.geosociety.org) ❖

## Earth Science Week celebration attracts attention of young and old alike

During Earth Science Week, October 7–13, KGS and the UK Department of Geological Sciences hosted a joint open house on October 10 that was attended by approximately 150 people. Activities included slide shows, an exhibit of amber, instructions on how to draw the dinosaur *Tyrannosaurus rex* and create trilobite masks, and an exhibit of rocks, minerals, fossils, and meteorites. KGS staff provided guided tours and educational talks at McConnell Springs for 140 elementary schoolchildren. Kentucky rocks, minerals, and fossils, and earth science displays were also exhibited at two public libraries. For more information about Earth Science Week 2002, contact **Carol Ruthven** at 859.257.5500 ext. 128 ([cruthven@kgs.mm.uky.edu](mailto:cruthven@kgs.mm.uky.edu)). ❖

Kentucky Geological Survey  
228 Mining & Mineral Resources Bldg.  
University of Kentucky  
Lexington, KY 40506-0107

*Address service requested*

*(Interns, continued from page 2)*

GPS unit and how to do field mapping, as well as digital mapping. I have also been exposed to well logging, seismic data, and coal quality. The area I was most interested in was the digitizing of the maps on the computer, and plotting our points that we obtained onto the maps. The time spent here was well worth it because it taught me things that are currently being done today.”

**William Knizner**, Eastern Kentucky University: “Overall this summer is one that I will not forget. I have already talked to several friends and recommended that they try to get an internship here next summer just for the experience. I sometimes refer to this experience as ‘field camp with pay.’ ” ❖

Nonprofit Organization  
U.S. Postage  
PAID  
Lexington, KY  
Permit No. 51